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VALIDATION OF THE WISC-R
FOR GRADE TWO FRENCH IMMERSION STUDENTS

by

BARBARA JEAN NIELSEN

B.A., Simon Fraser University, 1980

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ABSTRACT

The purpose of the present study was to investigate the appropriateness of the use of the Wechsler Intelligence Scale for Children-Revised (WISC-R) for assessment of French immersion students whose language of instruction at school has been solely French. To investigate this problem, the WISC-R performance of 29 grade two French immersion students was compared to that of 29 regular (English) program peers.

The rationale for the present study was based on the fact that the WISC-R has been commonly administered to French immersion children and interpreted as if this group of children were identical to the population on whom the test was standardized. While previous research has indicated that British Columbia students attain higher WISC-R means and less variance than American students, no data were available to suggest how the performance of this linguistically different group, French immersion students, compared to that of students who received all formal education in their first language, English.

All students obtained parental consent to participate in the study, came from homes in which English was the dominant language, and had been continuously enrolled from kindergarten through the end of grade two in their current academic programs. Groups were matched for gender and educational level of the head of the household.

All testing and scoring were done by graduate students who had been trained and supervised in the use of the WISC-R. A multivariate analysis

of variance was used to test the hypotheses of equal means and variances between the two groups on the 12 subtests and the Verbal and Performance factors. A univariate analysis was used to test the hypotheses of equal Full Scale means and variances between groups.

Comparative results indicated that the central tendancies and variance-covariance structure for both the French immersion and the regular program groups, matched for educational level of parents, were essentially the same. Both the immersion and regular program groups had Verbal, Performance and Full Scale IQs in Wechsler's High Average category.

Results of an ancillary analysis indicated that the 58 children in the present study had significantly higher Full Scale IQs than did a more representative British Columbia sample whose mean IQs were significantly higher than those published in the WISC-R manual.

It was concluded that although interpretation of the results is confounded by possible initial differences between groups, the use of the WISC-R appears not to be disadvantageous to higher SES French immersion children whose main language of the home is English. Further, it was concluded that, for British Columbia children, use of the British Columbia norms for the age groups, 7½, 9½ and 11½ is more appropriate than use of the 1974 Wechsler norms.

Research Supervisor: .....
Dr. W. T. Rogers

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CHAPTER I

INTRODUCTION

Background to the Problem

The number of Early French Immersion programs in Canada has greatly increased within the past decade. Although the opportunities for students in British Columbia to attend immersion programs may be more limited than they are for students in Quebec and Ontario, the number of programs is increasing yearly. During the 1976–77 school year Coquitlam, Victoria and Vancouver were the only three districts in British Columbia offering Early French Immersion. However, by the 1981–82 school year, the program was offered in 21 British Columbia districts.

When children from the early immersion programs are referred for educational assessment, the diagnostician is faced with the decision as to which diagnostic instruments are appropriate. Tests specifically designed and validated for use with French immersion students are rare, as indicated in a recent paper on testing in British Columbia by Conry, Conry, and D'Oyley (1982). These authors pointed out the need for demonstrated validity of French Immersion assessment devices. The Ontario Institute for Studies in Education (OISE) has recently published several tests of reading

comprehension specifically designed for French immersion students which, in addition to tests designed for use with native French-speaking students, are currently being used by diagnosticians. However, although psycho-educational assessment procedures vary, the Wechsler Intelligence Scale for Children-Revised (WISC-R) is routinely administered in English to both monolingual (regular English program) and bilingual (French immersion program) students. Holmes (1981) compared WISC-R performance of British Columbia students to that of the American group and found that the British Columbia group had a higher mean and less variance than Wechsler's group. However, no research is available to indicate that the WISC-R performance of children in French immersion programs is comparable to that of either their regular (English) program peers in British Columbia or that of the American standardization sample.

As the WISC-R is a highly-verbal test of general intelligence and as French immersion students are exposed only to French in the first three years in the formal educational setting, is it valid to assume that their access to learned information and their ability to use and comprehend their first language is equivalent to that of their monolingual peers so that performance on the WISC-R will be unaffected?

French Immersion Research

Two major questions related to the above-stated concern about WISC-R validity arise in much of the current French immersion research:

(1) Does immersion in a second-language educational environment (French) affect competency in the child's first language (English)?

(2) What effect does enrolment in an early French immersion program have on the intellectual and cognitive development of the child?

Findings related to these two questions will be discussed in greater detail in Chapter II, but results of current studies generally indicate no enduring negative effects of early French immersion on either English-language competency or cognitive and intellectual development (Lambert & Tucker, 1972; Genesee, 1978; Swain & Lapkin, 1981). In addition some researchers have reported superior performance of French immersion students in both first-language skills and cognitive flexibility (Peal & Lambert, 1962; Lambert & Tucker, 1972; Barik & Swain, 1976a).

However, many of the studies reporting positive results have involved only those students who have coped with and survived the French immersion experience. The effect of French immersion on children who are experiencing difficulty is less clear; there is controversy in the literature regarding the desirability of maintaining these children in French immersion programs (Bruck, 1978, 1979; Cummins, 1979a; Trites, 1976; Trites & Price, 1976, 1977 1978, 1980, 1981). These "problem" children may be switched to the regular English setting early in their academic careers and, therefore, would be excluded from followup immersion studies. These are also the children who are most likely to be referred for assessment and to whom the WISC-R would be administered.

Two other research issues have been identified which clearly suggest caution in the interpretation of French immersion research results: random assignment to groups and finding an appropriate control sample (Swain & Lapkin, 1981). Students are assigned to educational programs on the basis of numerous factors which often operate outside the educational system. These factors are not always readily identifiable and are often difficult to quantify. Rarely can control be exercised through the random assignment of students to educational programs. Since participation in the immersion

program is optional, parents make the decision whether or not to enrol their child in the French or the English program. Because the parents are responsible for this decision, the uniqueness of the French immersion group comes into question: who are these French Immersion children and why have their parents chosen this language of instruction for them? For example, parent surveys suggest differences in parental attitudes which may indicate that French immersion children are brighter or more extroverted, or more verbal, or simply more able to cope than their regular program peers (Swain & Lapkin, 1981; McEachern, 1980). French immersion parents also report fewer concerns than regular program parents about their child's ability to cope with an immersion class. Assignment to language of instruction, therefore, is not random. Also, selection of a control group of students who will be similar in all respects except for the language of instruction is unlikely. Consequently, because of differences between the two enrolment groups, one cannot simply interpret research to say that the bilingually educated students are doing as well as, or better, or worse than what they would be doing if they were schooled in a regular English program.

Another concern is the nature of the tests used in research (Swain & Lapkin, 1981). Tests developed in the United States may include content which is unfamiliar to Canadian children. While creating a problem for all assessments, this may be further compounded for a group that is linguistically different from the group on whom the test was initially standardized. Further, while Swain and Lapkin (1981) acknowledge that reference to test norms is inappropriate to the extent that the groups tested differ from the norming population, they suggest that the use of standardized tests in research permits comparisons across programs. But, because of the many variations in French immersion programs (discussed in Chapter II), comparison

of test scores across programs appears questionable. In addition to varying environmental circumstances, immersion programs differ in the timing and intensity of French as the medium of instruction. Therefore, French immersion research may be essentially community specific. Jacobovits (1972) suggests that because communities vary greatly, generalizations may not be valid from one community to the next.

At this point, clarification of two terms is necessary. In this report the term "monolingual" refers to children enrolled in the regular English program, and the term "bilingual" refers to students enrolled in the French immersion program. "Bilingual" students are being provided with "schooling" fully or partly in a second language with the object of making students proficient in the second language (Stern, 1972). However, all such bilingual programs also have the maintenance of the first language as an equally important goal of the total program.

The Problem

Coquitlam is a predominantly English-speaking community located within the greater Vancouver area of British Columbia. This district pioneered early French immersion programs in this province and at the time of this study offered a program in which French was the sole language of instruction from kindergarten through grades one and two. Grade three marked the gradual introduction of English and by the end of elementary school (grade seven) Language Arts was taught in both languages and core subjects in either French or English. Therefore, although at the end of elementary school students were working in both languages, during the first three years (K - 2) of elementary school the children learned to read and write exclusively in their second language.

The WISC-R is currently being used routinely for psycho-educational assessment of Early French Immersion children in the Coquitlam School District, although its validity for this purpose has not been formally investigated. Current research using other standardized instruments indicates that children enrolled in French immersion programs generally do not differ significantly from their monolingual peers in either their first-language skills or their cognitive ability when variables such as age, gender and environmental factors are considered. With the assumption that the WISC-R performance of these bilingual children does not differ significantly from that of their monolingual peers, test users administer the test to children from both language groups and report scores based on the American norms reported in the test manual. But, as pointed out earlier, Holmes (1981) found differences between the WISC-R performance of British Columbia students and that of the Wechsler standardization sample. However, no information is available as to whether British Columbia children who have received all of their formal education in French perform the same as their regular program peers on this highly-verbal English-language test of general intelligence. How appropriate are the inferences which are being made from the WISC-R test results for children enrolled in French immersion programs in the Coquitlam School District?

To investigate this question, the following hypotheses were tested:

(a) $$\vec{M}_F = \vec{M}_E$$

$$\vec{M}_F \neq \vec{M}_E$$

where $\vec{M}$ is the 12 x 1 vector of mean scores on the 12 subtests of the WISC-R; F denotes the French immersion sample, and E denotes the regular (English) sample; and

(b) $\Sigma_F = \Sigma_E$

$\Sigma_F \neq \Sigma_E$

where Σ is a 12 x 12 variance-covariance matrix with the variances of the 12 subtests along the principal diagonal and the covariances among the 12 subtests in the off-diagonal positions.

The purpose of this study, then, was to compare the WISC-R performance of a group of Early French Immersion students with that of a quasi-matched group of their regular (English) program peers. Students were tested at the end of their grade two year, at which time they had been enrolled continuously in their language of instruction program for about two and one-half school years. One full year of half-day kindergarten is treated as one-half school year. At this particular educational level, the French immersion children had not been exposed to any formal English-language instruction; nor had the regular (English) program students been exposed to any formal French-language instruction.

CHAPTER II

REVIEW OF THE LITERATURE

The review of the literature is focussed upon two major concerns relevant to WISC-R performance: the effect of the French immersion experience on English-language skills and on intelligence as measured by various tests of one or more facets of cognitive development. However, because it is important to consider the influences which limit generalizability of current research results, the review begins first with an overview of alternative forms of French immersion programs, followed by a brief discussion of situation-specific differences. Literature regarding the two major concerns is then reviewed and, finally, a review is presented of French immersion research in Coquitlam, the district from which the sample for this study was selected.

Alternative Forms of French Immersion Programs

There are three categories of French-as-a-second-language programs available in Canada: core, extended and immersion. In the core program, French is taught for a short period (20 to 40 minutes) once a day. The

extended programs include one or two subjects taught in French in addition to the core component. The immersion programs are those in which 50 to 100% of the students' academic content is taught using French as the medium of instruction. Because of the particular focus of this study, subsequent discussion is restricted to the nature and effects of immersion programs.

Three variations of the immersion program are: early total immersion, early partial immersion (also referred to as the bilingual program), and late French immersion. The three alternatives vary not only between forms but also within the same form in the timing and intensity of French as the medium of instruction.

In early French immersion the percentage of time spent in French in kindergarten and grade one is 100%. Following grade one, there are slight variations among programs, although their general structures are similar. For example, in Ontario a daily period of English language arts may be introduced in grade two or three; at grade five French remains the language of instruction for 60 to 80% of the school day; the percentage of French drops at grade six to about 40 to 50%; and in grades seven and eight half of the curriculum is taught in French and half in English (Swain & Lapkin, 1981). English is offered as early as grade two in some district programs (Lambert & Tucker, 1972) or as late as grades four and five in others (Genesee, 1982). In some districts the English portion of the program surpasses that of the French portion by grade six while in others the French portion exceeds or equals the English portion throughout the elementary grades. Students in some districts are offered course options in secondary school intended to maintain and enhance their second-language skills. Genesee (1982), in attempting to summarize these variations, describes the early immersion program as having three stages: an immersion

phase (prior to the introduction of English to the program), a bilingual phase (when both English and French are used in varying proportions), and a maintenance phase (when select courses are taught in French at the secondary school).

Swain and Lapkin (1981) report variations between early partial immersion programs. In Elgin County, Ontario, the program begins at the grade one level (following a half-day English kindergarten) with the two languages of instruction used equally throughout the students' elementary schooling. The Ottawa program differs slightly in that the program begins with a full-day kindergarten in which 50% of the school day is in French and 50% in English.

Genesee (1982) describes two types of late immersion, a one-year and a two-year option. The one-year program begins in grade seven with 85% of the curriculum taught in French followed by one or two French courses in each of grades eight to eleven. In the two-year program, all instruction (with the exception of English language arts) is in French followed by two French courses per year in grades nine and ten and one course in grade eleven. In British Columbia, late immersion programs start in grade six or seven and continue through grade eight. The percentage of time in which French is the language of instruction varies among districts. For example, in Coquitlam instruction is 100% French, while in Surrey it is 80% and in Langley it is 60% (Pfeiffer, 1980). Variability in the structure of programs is more pronounced for late immersion than for early immersion (Swain & Lapkin, 1981); however, for the most part the intensive "dose" of French comes in the initial year or two years of both programs, with the amount of exposure to instruction in French remaining constant or tapering off in subsequent years. Also, while parents make the decision to enroll their

children in early immersion, late immersion students themselves generally make this decision "with a little help from their friends, parents, and teachers" (Swain & Lapkin, 1981, p.43).

Several researchers have compared students in early immersion programs with students in late immersion programs. For example, Bruck, Lambert, & Tucker (1977) found that early immersion students represented a much broader range of scholastic and intellectual abilities than did the self-selected students in the later immersion program. Genesee (1982) reported that there are relatively few statistically significant differences in French language proficiency between comparable groups of early total immersion and two-year late immersion students when evaluated at the end of grades eight to eleven. He suggested that older learners may be faster second-language learners because of their greater cognitive and/or linguistic maturity. This maturity may account for the positive results of late immersion groups who by virtue of program selection have spent less time in the French-language instructional setting than early immersion students (Pfeiffer, 1980; Swain & Barik, 1981).

Other Situation-Specific Influences

In addition to the numerous program variations, there are also environmental factors which may influence research results. One factor is the amount of exposure to the French language both at school and in the community. Some programs are housed in dual-track schools where both French and English are offered as languages of instruction, while others are located in immersion "centres" where French is the only language of instruction in the school. Research suggests that French-language benefits may accrue to early French immersion students who study in "centres"; that is, in schools

where most activities outside the classroom occur in French (Lapkin, Andrew, Harley, Swain and Kamin, 1981). When comparing the French competence of immersion students in Canadian cities where there is a high percentage of French speaking residents compared to those in cities with a low percentage of French speakers, Swain (1981) found no appreciable differences between groups. However, program and environmental differences have led other researchers to suggest that, in many cases, French immersion research is situation-specific and may not be generalizable (Jakobovits, 1972; Shapson & Kaufman, 1978).

In summary, when interpreting French immersion research results, one must be aware that there may be situation-specific differences between the groups in one study and those in another which limit the comparability of the groups. Some of the variables to be considered when interpreting research results are: form of immersion program, English/French instructional time ratio, timing of English-language introduction to the program, and the language composition of both the school and community for which the sample was selected. Immersion students in the present study had 100% French instruction at school and were enrolled in dual-track (French and English) schools in a predominantly English-speaking community.

The Effect of the Immersion Experience on English Language Skills

The substantial amount of French immersion research completed during the past decade is in part a reaction to the concern of both parents and educators regarding the possible detrimental effects on the development of the English language skills of children enrolled in these programs. The concern is based on the assumption that if considerably less total time is spent through the medium of English, then English skills must inevitably suffer.

Many researchers between 192[illegible]nd 1960 reported that in comparison to unilingual children, bilingual children tended to perform more poorly in school, scored lower on the verbal parts of IQ tests and had "language handicaps" (Darcy, 1953; Peal and Lambert, 1962). However, in contrast to these earlier "negative" studies, many of which were poorly designed, recent evaluations from across Canada consistently show that although immersion students tend to lag behind their monolingual peers in English language arts until formal English instruction is introduced, they quickly catch up in their literacy skills and may even surpass their peers by grade five or six. A number of longitudinal studies indicate that elementary school children whose first language is English experience no lasting setbacks in first-language competence or academic achievement as a result of participating in early immersion programs in which all or much of their school curriculum is taught via a second language (Lambert & Tucker, 1972; Genesee, 1978). Even in the double-immersion (French and Hebrew) program evaluated by Genesee and Lambert (1983), children who had first-language (English) instruction postponed until at least grade three did not evidence any long-term detrimental effects on first-language development as measured by reading and spelling tests. Cummins (1983) suggests that there is a significant positive relationship between the amount of instructional time in French and achievement in that language, but that there is little relationship between English achievement and instructional time through English.

Lambert and Tucker (1972) compared the linguistic development of English-speaking Quebec students in a pilot French immersion program with that of their monolingual peers from kindergarten through grade four. Results indicated that immersion children achieved satisfactory proficiency in the French language without detrimental effects either to English language

skills or to progress in other academic areas. Students in this experimental program were from an upper-middle-class area of Montreal and parents were very involved and committed to the program. Lambert, Tucker, and d'Anglejan (1973) reported similar positive results for a follow-up study of these children in grade five. Standardized achievement test scores for both the French and English groups averaged about one standard deviation above the published mean.

Swain and Lapkin (1981) summarized ten years of research on bilingual education in Ontario and concluded that the English language skills of both early total and early partial immersion students lagged behind those of their regular program peers prior to the introduction of English language arts. For late immersion students, the duration of the lag was shorter or did not occur at all. After the introduction of English language arts to the curriculum, early immersion students performed as well as, or better than, regular program control groups on standardized tests of English language skills. It has been suggested (Lambert and Tucker, 1972; Cummins, 1979b) that reported advantages in English experienced by early total immersion students in the middle and upper elementary grades can perhaps be explained by their knowledge of two different language systems, a knowledge which may permit them to compare and contrast French and English and heighten their overall linguistic awareness.

Barik and Swain (1974, 1975, 1976b) found immersion children in the primary grades in Ontario to lag in the development of English language literacy skills compared to their monolingual peers; however, immersion students made adequate progress in mathematics. The immersion group scored significantly higher than the comparison group on the Metropolitan Achievement Test (MAT) Arithmetic computational items but not on verbal Arithmetic

items. Students were generally from the middle to upper-middle socio-economic class; children with hearing, perceptual or related problems were excluded from the testing; and no information was provided regarding drop-outs from the program.

Genesee (1978) found that immersion students in grades one to three performed at an equivalent level to that of their monolingual peers on tests of vocabulary, word associations, listening comprehension, and storytelling.

Genesee, Tucker, and Lambert (1975) reported that immersion students in kindergarten and grades one and two appeared to interact effectively in conversation and to be more sensitive to the communication needs of listeners than their regular program peers. All children were native English speakers and were tested in English. In this study, children were asked to explain how to play a game to two different listeners, one blindfolded and one not blindfolded. There were no significant differences between the groups in terms of how many rules they mentioned to each listener; however, the immersion students mentioned more about the materials of the game to the blindfolded versus the sighted listener than did the monolingual group.

Kaufman and Shapson (1975) reported that British Columbia immersion students compared to their English counterparts did not perform as well on the reading, word knowledge, word analysis, and spelling MAT subtests prior to the introduction of English language arts in grade three. French immersion students in grades one and two did score within the average range according to test norms; however, the regular program students scored above average (70 - 80 percentile range). The finding that the immersion students achieved scores in the average range in spite of receiving no formal English-language instruction at school was interpreted by the researchers as evidence of

transfer of learning from the French educational setting to an English situation.

This transfer of learning from one language to the other is evident in the results of other studies as well. Curriculum in the primary grades focusses mainly on language arts and mathematics; therefore, research testing has concentrated on these areas.

Swain and Lapkin (1981) reported results for 38 separate group administrations of standardized mathematics achievement tests in Ontario for students in grades one through eight. At the grade three level, it appeared that in some cases the performance of immersion children was at a lower level than that of their monolingual peers on problem solving tasks (requiring literacy skills); however, the majority of comparisons across the entire age range indicated no statistically significant differences between groups. This finding suggests that immersion children were able to learn mathematics in French and transfer the knowledge acquired in a French context to an English context.

Reviewing a decade of research, Swain and Lapkin (1981) concluded that in the long run immersion students were "able to maintain standards of achievement consistent with those of their English-educated peers" (p.106), but that early in the immersion program their second language skills may be "insufficient to deal with the complexities of the subject material taught to them in French" (p.106). However, given the high SES status of many French immersion children (Trites & Price, 1980), environmental factors may provide sufficient opportunities to develop English-language skills to a level required for the complexities of WISC-R tasks.

The Effects of Immersion on Cognitive and Intellectual Development

Early studies of the relationship between bilingualism and cognitive development frequently reported a negative association between bilingualism and both verbal intelligence and academic skills. Many early investigators concluded that bilingual students suffered from what was termed a "language handicap" or "mental confusion" (Darcy, 1953). However, in the majority of these studies socio-economic status and student proficiency in the language of the test were not considered. Many studies were carried out with minority-language children whose first language (L1) was gradually being replaced by a more dominant and prestigious second language (L2). Lambert (1975) calls this form of bilingualism "subtractive", whereas French immersion children are generally in an "additive" situation. For French immersion children both languages have social value and respect in the bilingual learning situation. Because the bilingual student's L1 is dominant or at least prestigious, it is in no danger of replacement by L2; the immersion experience adds another socially relevant language to the student's repertory of skills. Further, McLaughlin (1978, pp.168-171) purports that the inferiority of bilingual children is a function of the type of test used: if non-verbal materials are used, no differences between groups are found; however, if materials are verbal, the monolingual children usually score higher. Thus, to a large extent, poor research designs have led to results which indicate that bilingual children obtain lower IQ scores than unilingual children.

Peal and Lambert (1967) reviewed studies which attempted to determine whether monolingual and bilingual children differed in intelligence as measured by standardized tests. They found that many researchers concluded that bilingualism had a detrimental effect on intellectual functioning.

The bilingual child was described as being hampered in his performance on intelligence tests in comparison with the monolingual child. Some studies indicated that bilingualism had little or no influence on intelligence. Only two empirical studies suggested that bilingualism had a favorable effect on intelligence.

To investigate the intellectual consequences of bilingual education, Peal and Lambert (1967) compared ten-year-old French-English bilingual and French monolingual children in middle-class Montreal schools and found the bilingual students to be intellectually superior, to possess greater verbal skills, to exhibit greater mental flexibility, to be more facile at concept formation, and to achieve higher grades in school. Bilingual students scored significantly higher on all verbal and most non-verbal parts of tests. On none of the subtests did the monolingual students score higher than the bilinguals. However, the method of selection of the bilingual group may have led to a sample of children who were more intelligent to begin with than the monolingual group; they selected only bilingual students whose English (L2) was equivalent to their French (L1) as measured by tests in English and French. The authors speculated that since bilingual children have two symbols for every object, they conceptualize environomental events in terms of their general properties without reliance on linguistic symbols and, therefore, they are more skilled in abstract concepts and relations.

More recent studies have focussed on the comparison of French-English bilingual students with English monolingual students.

Lambert and Tucker (1972) administered the Raven's Progressive Matrices to both bilingual and monolingual (English) children in St. Lambert, Quebec, at the beginning of grade one and found no significant differences between groups. Retested at the end of grade one, the pilot French group had

significantly lower scores than an English control group, while a later group of grade one immersion students did not differ significantly from their English peers. In addition, there were no significant differences between groups on the total scores of the Lorge-Thorndike group intelligence test at the end of grade one. No signs of any intellectual deficit or retardation were evident in follow-up yearly testing of this group of Montreal children.

Lambert, Tucker, and d'Anglejan (1973) reported significant advantages to bilinguals on a series of creativity measures by the end of their primary years in the St. Lambert program. Immersion children had higher scores than their regular program peers on letter sequence, rhyming definitions, and unusual uses tests, which all require rapidity and cleverness in generating novel ideas. Performance on the Lorge-Thorndike Verbal Battery, which requires a basic understanding of English language and literacy skills, was equivalent for both groups on all subtests: concept vocabulary, concept extension, and synonyms.

Cummins and Gulutsan (1974) examined some cognitive aspects, in particular divergent thinking, among grade six balanced-bilingual and monolingual children in Edmonton. The bilingual group performed significantly better than the unilingual group on verbal ability and general reasoning subtests and also on a measure of originality in the verbal test of divergence.

Bruck, Lambert, and Tucker (1974), in a follow-up study of the St. Lambert project at grade seven, found that when differences between immersion and English-educated students occurred on measures of cognitive flexibility and divergent thinking, they consistently favored the immersion students. No detrimental effects upon academic, linguistic or cognitive development were reported. Another finding of this study was that when

early immersion students were compared to late immersion students, intelligence test results indicated that the early immersion students represented a much broader range of scholastic and intellectual abilities than did the self-selected students in the later immersion program.

Barik and Swain (1976a) compared IQ data obtained over a five-year period (grades K - 4) between French immersion and regular program children. Although year-by-year results did not suggest IQ differences between the two groups, repeated measures analysis indicated that the immersion group had a higher IQ measure over the five-year period. It is possible that children with lower IQs had dropped out of the immersion program by grade four. Considering grades one to three only, the two groups did not score differently with respect to either the overall Otis-Lennon IQ score or specific subtest scores (classification/categorization, analogies, following of verbal directions) when scores were adjusted for initial IQ and age differences.

Genesee (1978) reported the results of a longitudinal evaluation of a Montreal French immersion program including grades one through six. There was a statistically significant difference between the grade one group and the regular program (English) group on the Lorge-Thorndike Intelligence Test in favor of the immersion students. Also, at the grade one level results of the Raven's Progressive Matrices favor the immersion group. By the end of grade three there were no significant differences between groups on either of these two intelligence tests.

Oren (1981) studied the effects of bilingualism and monolingualism on the cognitive ability of pre-school children from upper and upper-middle class homes to label and relabel objects. Results indicated that early bilingualism was advantageous to the conceptualization of the notion of

symbols. Children in this study had various language backgrounds.

Feldman and Shen (1971) found that five-year-old bilingual Head Start children led a matched group of monolinguals in tasks involving object constancy, naming, and the use of names in sentences. Also, bilingual children in their study performed consistently better in tasks requiring non-verbal responses.

Ianco-Worrall (1972) compared Afrikaans-English bilinguals in South Africa to both Afrikaans and English monolinguals (ages 4-6 to 7-9 years) on the separation of word sound from word meaning. Attention to meaning or to sound of words was tested with a semantic and phonetic preference test, a two-choice test in which similarity between words could be interpreted on the basis of shared meaning or shared acoustic properties. Results supporte the hypothesis that bilingualism leads to the earlier realization of the arbitrary nature of name-object relationship.

Ben-Zeev (1977) compared the cognitive strategies of two groups of Hebrew-English bilingual children, one group tested in the United States and the other group in Israel, with two corresponding monolingual groups, one tested in the United States speaking only English and one tested in Israel speaking only Hebrew. The age range of the children in the sample was 5-4 to 8-6 years (mean = 7.0 years). IQ was estimated from four WISC subtests (Similarities, Digit Span, Picture Completion, and Picture Arrangement) and used as a control in the main experiment. An analysis of variance indicated there was no significant difference between bilingual and monolingual groups for total estimated IQ. The average IQ was 113. Performance on individual subtests was not reported. Monolingual students showed superior performance on the Peabody Picture Vocabulary Test; however, on measures of semantic knowledge, flexibility in semantic rule usage, and

non-verbal system understanding the bilingual group showed more advanced processing of verbal material, more discriminating perceptual distinctions, more propensity to search for structure in perceptual situations, and more capacity to reorganize their perceptions in response to feedback.

Individual intelligence tests have been used in French immersion research mainly to describe children who either are experiencing difficulty in the immersion program or who have switched to the regular English program. Trites and Price (1976) found that children who had difficulty in early French immersion had high WISC IQs and excellent sensory-motor functions, but performed more poorly on a complex psychomotor problem-solving task than groups of children who had been diagnosed as having primary reading disability, minimal brain dysfunction, primary emotional disturbance, or as being hyperactive. Results were interpreted as evidence of a maturational lag in the temporal lobe regions of the brain which subserve verbal and non-verbal perceptual functions and contain the auditory centres of the cerebral cortex. The lag was not evident after age nine. Trites and Price (1977) found that children who transferred out of the French immersion program had lower verbal IQs and were experiencing more academic problems than were children who remained in French immersion in spite of reported difficulties.

Trites and Price (1978, 1980) reported results of a three-phase study of readiness for French immersion. In the first phase, the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), which correlates .82 with the WISC-R Full Scale IQ (Wechsler, 1974, p.48), was administered as part of an extensive battery to randomly selected four-year-old Ottawa kindergarten children who were scheduled to enter a primary French immersion program for five-year-olds. These children were involved in follow-up

studies at the end of five-year-old kindergarten (phase two) and at the end of grade one (phase three). However, the sample differed each year because, in spite of Bright-Normal to Superior intelligence, 25 of the initial sample of 200 students had dropped out of the immersion program by phase three. Phase three groups differed significantly in terms of IQ as initially measured by the WPPSI in four-year-old kindergarten. Children who were still in French programs during phase three of the study had significantly higher Full Scale scores than children in the English program who had dropped out of immersion or had never been enrolled in it (even though parents had expressed intent to enrol them). In addition, dropouts had significantly higher Full Scale scores than the children who had never been in French immersion. All groups had high IQ scores; all children came from upper-middle to lower-upper-class homes. Information about the biographical and background information of 1000 four-year-old kindergarten children from which the sample was selected indicated that children entering French immersion tended to come from higher SES and more advantaged homes, attended preschool more frequently, were read to at home more frequently, and had positive parental attitudes towards the French language.

A questionnaire completed by both French Immersion (FI) and English language (EL) parents indicated that children in French immersion programs may have started school with some undefinable cognitive advantages (McEachern 1980). Fifteen percent of the FI parents felt their children would need parental help to succeed in French immersion; in contrast, 46% of the EL parents felt that way. Forty percent of the EL parents felt their children would have greater adjustment problems in school than regular students, whereas only 2% of the FI parents responded that way. In addition, 94% of the FI parents did not feel that French immersion was too difficult for

their children, while only 63% of the EL parents shared this feeling.

In summary, the literature suggests that while French immersion may lead to cognitive advantages in the long run, this does not appear to be the case in the early stages of the program. However, test performance generally appears to be equivalent to that of regular English program peers during the primary grades.

The Coquitlam Early French Immersion Program

The Coquitlam program started in 1968 as a bilingual program in which the language of instruction was 80% French in kindergarten and 50% French in grades one through seven. The bilingual program was replaced in 1973 by the early total immersion model in which students received 100% French instruction from kindergarten through grade two. The number of schools offering this option increased simultaneously with the demand for education through the medium of French. During the 1982-83 school year, five schools offered early French immersion and two offered late immersion (grades six and seven). In addition, a secondary school program was available in which students were immersed for one semester in French (except for English language arts).

The Coquitlam immersion program has been the focus of a longitudinal study of the effects of immersion on students' English language skills and their proficiency in the French language (Shapson & Kaufman, 1978; Shapson & Day, 1982). This study followed the progress of two French immersion cohorts compared to a control group of regular program peers. The immersion experience of the two cohorts differed in the initial grades; cohort I received 20% English instruction in kindergarten, 100% French instruction in grade one and 20% English instruction in grade two, while cohort II

received no English instruction until grade three. Thereafter, the programs were similar for both cohorts with 75% French instruction time in grade three and 50% in grades four through six.

As a measure of general intelligence, the Canadian Cognitive Abilities Test (CCAT) was administered at the beginning of the first year of the study. The Metropolitan Achievement Test (MAT) was administered as a measure of English literacy skills. Several measures of French achievement (literacy skills and aural comprehension) were administered. No measure of English-language oral communication skills was included. All tests used were group administered.

CCAT scores indicated no significant cognitive differences between French and English groups at the beginning of the study. Scores obtained at that time were used as covariates in all subsequent analyses of achievement test scores.

As discussed earlier in this chapter, evaluation during the primary grades (Shapson & Kaufman, 1978) indicated that French immersion students lagged behind their monolingual peers on tests of English literacy skills at the end of grades one and two. No evidence of the lag (with the exception of spelling) was apparent after the introduction of English language arts in grade three. English language skills were monitored only until the end of grade four at which time the immersion children no longer showed any of the lags which were evident in the early grades (Shapson & Day, 1982). Mathematics achievement was equivalent for all groups at the grades one and two levels, so was not evaluated in later grades.

In summary, evidence from a longitudinal investigation of the Coquitlam early immersion program showed that French immersion students, compared to their regular program peers, were equivalent in mathematics achievement,

and were equivalent in English-language literacy skills after the introduction of English language arts in grade three. No evidence was available to indicate either stability of IQ scores across grade levels nor proficiency in English-language oral communication in a testing situation.

CHAPTER III

METHODOLOGY

The purpose of the present study was to compare the WISC-R performance of a group of grade two French immersion students with that of a group of their peers enrolled in the regular program. Briefly, the procedure followed was to administer the WISC-R to each of the students, then to analyse the data in terms of central tendancy and variance-covariance structure.

A complete description of the methodology is presented in this chapter. First, sampling procedures and a description of the sample are outlined, followed by a description of the measuring instrument, the WISC-R. Next, the data collection and preparation are described. Finally, the data analyses are presented.

The Sample

The sample for this study was selected from grade two classes at the five Coquitlam schools which offered early French immersion programs. The five schools, all of which were dual-track (each offered both immersion and

regular English programs), were geographically located throughout the school district to serve each of the areas within the district, as shown in Figure 1. The grade two enrolments are shown in Table 1.

Table 1

Grade Two Enrolment in the
Dual-Track (English/French) Schools
1982-83

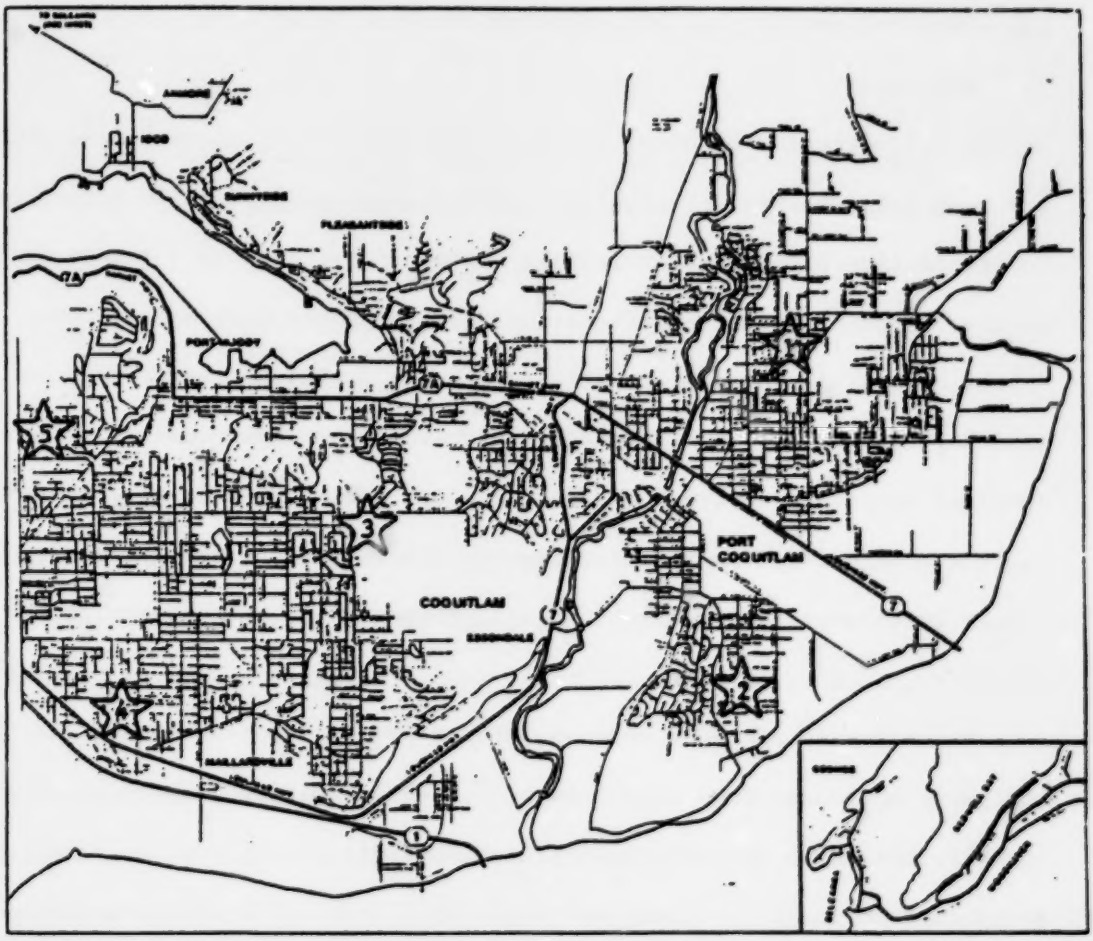
School	French	English
Alderson	26	26
Glenayre	23	13
Hillcrest	47	15
Irvine	17	40
Kilmer	23	30
Total	136	124

Five boys and five girls were randomly selected from the French immersion classes in each of the five schools. Thirty girls and 30 boys were randomly selected from combined grade two regular program classes in the five schools. Both the literature review and informal interviews with principals and teachers suggested that the average SES level of French immersion students was higher than that of the English students; therefore, in order to match the two groups for educational level of parent, a greater number of English (n = 60) than French students (n = 50) was initially selected.

Letters informing parents of the purpose and nature of the study were sent home with the selected students along with forms requesting both parental consent for student participation in the study and background

Figure 1

Location and Enrolment of
Dual-Track Schools in the Coquitlam School District



1. Irvine (425)
2. Killmer (440)
3. Hillcrest (475)
4. Alderson (417)
5. Glenayre (319)

information. Copies of these forms are provided in Appendix A.

Information obtained on these forms provided the basis for selecting the final sample for this study. The selection criteria were:

(1) English was the main language spoken in the home;

(2) Enrolment in the current language of instruction had been continuous from kindergarten through to the time of testing; and

(3) Parental consent had been obtained for the child's participation in the study.

Of the 110 letters sent home, 103 were returned. Four of the seven students for whom letters were not returned either had moved or were to move prior to the testing period. Four parents did not provide consent for participation of their children in the study. Two students were absent from school on testing dates, five were from homes in which a language other than English was the main language, and six had not been continuously enrolled in either language of instruction. Educational level of parent was not provided for an additional two students. Consequently, the resulting sample sizes were 39 for the bilingual group and 45 for the monolingual group.

Parents were asked to provide information on a socio-economic variable: the level of education of the head of household, defined as the major income earner (see parent consent form, Appendix A). Thorndike (1951) found this variable to correlate highly with children's intelligence. The distribution of this SES variable in the initial samples is presented in Table 2. Students in the immersion group were later matched for this variable with students in the regular (English) program, and two quasi-matched groups of 29 were obtained (see Table 5, Chapter IV).

Table 2

SES Level of Household
by Language of Instruction by Gender of Student

Language of Instruction	SES Level							
	Male				Female			
	I	II	III	IV	I	II	III	IV
French	1	5	3	11	1	2	8	8
English	2	10	7	5	3	6	8	4

Note: Based on information obtained from parent-consent forms.

Categories for head of household educational level were:

I Less than high school completion
II High school completion
III Post-secondary, no degree
IV University or college degree

WISC-R

The Wechsler Intelligence Scale for Children - Revised (WISC-R) is frequently used in Canadian school districts (Note 1). It is one of the main instruments administered during psycho-educational assessments in Coquitlam, the district in which this study was conducted. In addition to being the most widely used individual intelligence test (Mercer, 1979; Hopkins & Stanley, 1981), it has served as the criterion test against which other measures of intelligence have been validated (Bersoff, 1980).

The WISC-R is an individually administered test of "global" intelligence which Wechsler (1974) conceives of as a "multidimensional and multifaceted entity rather than an independent, uniquely-defined trait" (p.5). The WISC-R covers an age range from 6-0 to 16-11 years and consists

of 12 subtests (see Table 3). Six subtests are classified as measuring verbal measures and six as performance (or non-verbal) measures. Although the latter six subtests are categorized as non-verbal measures, a good command of the English language is required in order to comprehend and perform the tasks since directions are given in English. Scaled scores from 10 subtests are combined to yield three summary IQ scores each with a mean of 100 and standard deviation of 15: the Verbal IQ, the Performance IQ, and the Full Scale IQ. The remaining two subtests, Digit Span and Mazes, are used as supplementary tests both to replace invalid results on regular subtests and to gain further information. Scaled scores for individual subtests have means of 10 and standard deviations of three.

The WISC-R was standardized on 2200 white and non-white American children of ages 6-6 to 16-6. The standardization group was further stratified by sex, race, geographic region, occupation of head of household, and urban-rural residence according to 1970 census information.

The reliabilities of the Verbal, Performance and Full Scales reported in the manual are high (average of .94, .90 and .96, respectively), with a standard error of measurement for the Full Scale of about three IQ points. Average subtest reliability coefficients range from .70 to .86. The WISC-R has adequate validity (Salvia & Ysseldyke, 1981; Sattler, 1982). Comparison of the WISC-R with a variety of ability and achievement tests and school grades has resulted in median correlations ranging from the upper .30s to low .80s.

Holmes (1981) found that for representative samples of British Columbia children, 7½, 9½ and 11½ years of age, the means were higher and less variable than Wechsler's sample. Based on this information, WISC-R scores for the present Coquitlam sample were expected to be more consistent with

Table 3

WISC-R Subtests

1. Information - measures the wealth of available information acquired as a result of native ability and early cultural experience.

2. Similarities - measures verbal concept formation.

3. Arithmetic - measures numerical reasoning ability.

4. Vocabulary - measures a variety of functions, including language development, learning ability, and fund of information.

5. Comprehension - measures social judgment: the ability to use facts in pertinent, meaningful and emotionally appropriate manner.

6. Picture Completion - measures the ability to differentiate essential from non-essential details.

7. Picture Arrangement - measures non-verbal reasoning ability; also may be viewed as a measure of planning ability; i.e., the ability to comprehend and size up a total situation.

8. Block Design - measures visual-motor coordination and perceptual organization.

9. Object Assembly - measures perceptual organization ability.

10. Coding - measures visual-motor coordination, speed of mental operation, and short-term memory.

Supplementary subtests:

11. Digit Span - measures short-term memory and attention.

12. Mazes - measures planning ability and perceptual organization.

(Sattler, 1982, pp.188-189)

Holmes's results than with the results for the American standardization sample.

Testing

All 12 WISC-R subtests were administered to each of the 84 children in the total sample following the procedures described in the test manual (Wechsler, 1974). All testing was done by four female Level C testers (Cronbach, 1970) who had been trained and supervised in the administration and scoring of the WISC-R. Testing took place in the appropriate schools during the regular instructional day in the period between April 18 and May 20, 1983. Each administration took approximately 90 minutes. Schools were contacted in advance to arrange time and appropriate space for test administration. A student code number, language of instruction, gender, and parent educational level were recorded on each test protocal. This procedure allowed identification of each student in terms of the stratification variables. Birthdates were also recorded because this information was required for reference to appropriate norms and for descriptive sample information. Subject anonymity was guaranteed by the absence of student names on test protocals.

Scoring and Data Preparation

Completed protocals were scored by the respective testers following the directions given in the test manual (Wechsler, 1974). Second party verification for 50% of the test protocals revealed a .005 scoring error rate. Using the Wechsler norms, scaled scores for each of the 12 subtests and three sums of scaled scores (Verbal, Performance and Full Scale) were obtained for each child. The Verbal Score and Performance Score are the

sums of the verbal subtest scaled scores (excluding Digit Span) and the five performance subtests scaled scores (excluding Mazes), respectively. The Full Scale Score is the sum of all subtest scores (excluding Digit Span and Mazes). The data were then coded with 20% random verification and keypunched with 100% verification. No errors were found in coding.

Data Analyses

Internal consistency (split-half) reliability coefficients for all subtests except Digit Span and Coding were obtained by calculating correlations between split-half totals (odd/even) using the Statistical Package for the Social Sciences (SPSS), then correcting for length using the Spearman-Brown formula. The split-half technique was not appropriate for either Digit Span or Coding because the scaled score for Digit Span is considered to be a combined score for two independent tests and Coding is a speeded test. Some of the subtests have variable basal levels below which items are scored as correct although they are not in fact included in the questioning. To avoid artificially inflating internal consistency estimates by including these items, total "odd" score and total "even" score were calculated on the basis of items actually presented; that is, all items within the basal to ceiling range (see Table 4). This was not necessary for Similarities and Object Assembly because for these subtests the basal item is fixed at item #1 for all ages.

The coefficients for the IQ Scales were obtained from the formula for the reliability of a composite group of tests (Guildford, 1954, p.393). These are based on subtest combinations excluding Coding and Digit Span.

To test the earlier stated hypotheses that the mean performances of the French and English groups are identical and the variance-covariance

Table 4

Form of Reliability Coefficient Computed

Score	Reliability Coefficient	Components
Information	split-half (odd vs. even items), Spearman-Brown correction	basal item to ceiling item
Similarities	split-half (odd vs. even items), Spearman-Brown correction	item #1 to ceiling item
Arithmetic	split-half (odd vs. even items), Spearman-Brown correction	basal item to ceiling item
Vocabulary	split-half (odd vs. even items), Spearman-Brown correction	basal item to ceiling item
Comprehension	split-half (odd vs. even items), Spearman-Brown correction	basal item to ceiling item
Picture Completion	split-half (odd vs. even items), Spearman-Brown correction	basal item to ceiling item
Picture Arrangement	split-half (odd vs. even items), Spearman-Brown correction	basal item to ceiling item
Block Design	split-half (odd vs. even items), Spearman-Brown correction	basal item to ceiling item
Object Assembly	split-half (#1 & #4 vs. #2 & #3), Spearman-Brown correction	all items
Mazes	split-half (odd vs. even items), Spearman-Brown correction	basal item to ceiling item
Verbal IQ	reliability of a composite group of tests (Guilford, 1954)	5 verbal tests
Performance IQ	reliability of a composite group of tests (Guilford, 1954)	5 performance tests
Full Scale IQ	reliability of a composite group of tests (Guilford, 1954)	10 tests

structures are identical, two multivariate analyses of variance (Tatsuoka, 1971) were performed: the first for the 12 subtests, and the second for the Verbal and Performance IQ scores. Lastly, a third analysis, univariate in nature, was performed to test the equality of the mean Full Scale IQ scores and equality of the corresponding variances. The .05 level of significance was used in all three analyses. The necessary computations were performed using the computer program OWMAR (Hakstian & Bay, Note 2).

All computations were performed on an AMDAHL 470/V8 computer maintained by the Computing Centre, University of British Columbia.

CHAPTER IV

RESULTS

In this chapter a description of the final sample of students is presented, followed by the results of the data analyses described in the previous chapter. Lastly, an ancillary analysis is presented in which the performance of a group of seven-year-old B.C. students (Holmes, 1981) was compared to the performance of the combined groups in the present study.

The Sample

Eighty-four of the 110 randomly sampled students (39 bilingual and 45 monolingual) conformed to the three criteria required for this investigation: English was the main language of the home; they had been enrolled continuously from kindergarten through grade two in their current language of instruction; and parental consent had been obtained for the child's participation in the study. When students from the French group were matched with their regular (English) program peers for educational level of the family's major income earner (see Table 5), two quasi-matched groups of 29 were obtained. Students were selected for these groups according to the order

Table 5

SES Composition of Quasi-Matched Groups

Language of Instruction	Males				Females			
	I	II	III	IV	I	II	III	IV
French	1	5	3	5	1	2	8	4
English	1	5	3	5	1	2	8	4

Note: Based on information obtained from parent-consent forms.

Categories for head of household educational level were:

I Less than high school completion
II High school completion
III Post-secondary, no degree
IV University or college degree

in which they were randomly selected for the initial groups. Each group was composed of 14 males and 15 females. The average age of immersion students was 7 years, 10 months; the average age for the comparison group was 7 years, 11 months. The distribution shown in Table 5 indicates that this sample was skewed towards higher SES. Census data (1971) indicated that the percentage of British Columbians in each category was: I - 29%, II - 27%, III - 20%, IV - 24%. In contrast, percentages in the present study were: I - 7%, II - 24%, III - 38%, IV - 31%.

Comparative Results

Means and Standard deviations are presented in Table 6. IQ scores for both groups are in the High Average (Bright) classification (Wechsler, 1974, p.26). Verbal, Performance and Full Scale IQs for French immersion children were 110, 115 and 114, respectively compared to 110, 114 and 113

for the English group.[1]

Table 6

Means, Standard Deviations and Reliability Cooefficients for Quasi-Matched Groups

	French Immersion Group			Regular Program Group		
	Mean	s.d.	r	Mean	s.d.	r
Verbal Subtests						
Information	11.24	2.55	.64	11.48	2.56	.88
Similarities	11.31	2.90	.55	12.14	2.48	.62
Arithmetic	11.72	2.66	.57	10.79	2.31	.63
Vocabulary	12.21	2.85	.82	12.59	2.60	.67
Comprehension	11.72	3.23	.72	11.14	2.89	.71
Digit Span	10.86	2.31	*	10.55	2.13	*
Performance Subtests						
Picture Completion	12.00	2.65	.77	11.83	1.87	.77
Picture Arrangement	11.90	3.36	.72	12.72	3.14	.64
Block Design	13.31	3.71	.86	13.21	2.01	.17
Object Assembly	12.45	2.56	.32	11.55	2.63	.61
Coding	10.41	3.39	*	10.69	2.99	*
Mazes	12.69	2.49	.49	13.59	2.75	.73
Sums of Scaled Scores						
Verbal IQ	109.69	12.28	.87	109.52	11.71	.89
Performance IQ	115.14	11.18	.77	113.72	10.18	.67
Full Scale IQ	113.55	11.64	.87	112.69	10.29	.87

* The split-half technique for computing reliability coefficients was not appropriate for either Digit Span or Coding because the scaled score for Digit Span is considered to be a combined score for two independent tests and Coding is a speeded test.

[1] Means and standard deviations for total groups prior to SES stratification are presented in Appendix B.

To test the hypothesis of equal central tendency, Hotelling's T^2 was computed. To test the homogeneity of variance-covariance, the Bartlett-Box test was used. The results of these analyses are reported in Table 7. As shown, three separate analyses were performed: for the 12 subtests; for the Verbal and Performance IQ; and for the Full Scale IQ.

The results shown indicate that the central tendencies and variance-covariance structures of both the French immersion and the regular program students performed essentially the same at the .05 level of significance. No differences were found between mean scores and between the variance-covariance matrices. Therefore, the use of the WISC-R appears not to be disadvantageous to higher SES students at this level of the French immersion program.

Table 7

Summary of Analysis of Variance
Quasi-Matched Groups

	Test	F	p
I	12 WISC-R Subtests		
	Bartlett-Box Homogeneity of Variance-Covariance	.95	nsd
	Hotelling's T^2 for Two Groups	.70	nsd
II	Verbal IQ and Performance IQ		
	Bartlett-Box Homogeneity of Variance-Covariance	.22	nsd
	Hotelling's T^2 for Two Groups	.13	nsd
III	Full Scale IQ		
	Homogeneity of Variance	1.28	nsd
	Student's t for Two Groups	.30	nsd

Note: Multivariate analysis for I and II; univariate analysis for III; .05 Level of Significance adopted for this study.

Ancillary Analysis

A comparison of Holmes' (1981) data with results of the present study is presented in Table 8. Both Holmes' group of 7½ year-old British Columbia children and the combined matched groups in this study had higher Verbal, Performance and Full Scale IQ means than those reported in the WISC-R manual (means = 100). Results of these two studies suggest that use of the American norms for British Columbia children may lead to unrealistic expectations of performance compared with other British Columbia children. For example, children with Full Scale IQs of 100 (using Wechsler norms) are expected to perform academically in the middle of the average range of same-age peers. However, Holmes' and Nielsen's results both suggest that a more realistic expectation might be performance in the lower end of the average range.

Table 8

Comparison of Holmes and Nielsen Mean IQ Scores

	Holmes[a]		Nielsen[b]		
	Mean	s.d.	Mean	s.d.	t
Verbal IQ	106.08	(13.79)	109.60	(12.00)	1.65
Performance IQ	109.92	(13.11)	114.43	(10.69)	2.26*
Full Scale IQ	108.16	(12.35)	113.12	(10.99)	2.3[illegible]

[a] N = 115

[b] N = 58 (combined matched groups)

* Significant at the .05 Level.

T-tests were performed to determine the significance of differences between group means. Results indicate that the present sample (Nielsen) had significantly higher mean Performance and Full Scale IQs than Holmes' group. Holmes' sample more accurately represented the British Columbia SES distribution, whereas the Nielsen sample consisted of a greater percentage of higher SES children. The correlation between SES and academic potential probably accounts for the differences between Holmes' and Nielsen's group means.

CHAPTER V

SUMMARY AND CONCLUSIONS

The WISC-R performance of 29 grade two children enrolled in an early French immersion program in Coquitlam, British Columbia, was compared to that of 29 of their regular English program peers. All students came from homes in which English was the main language and all had been enrolled continuously since kindergarten in the current language of instruction. Groups were matched for educational level of the head of the household defined as the major income earner. Parents of 20 of the 29 students in each group reported an educational level beyond high school graduation. The test was administered in English at the end of the students' grade two year, at which time French immersion children had been exposed to no formal English-language instruction at school.

Analysis of the 12 subtests and three IQ scores revealed no significant differences in central tendency or variance-covariance structure between the two groups. For both the immersion and the regular program groups, means were higher than those reported in the WISC-R manual, and there was generally less variance in scores. Verbal, Performance and Full Scale IQ

scores for both groups were in the category which Wechsler describes as High Average.

Limitations of the Study

While the implications of these results are encouraging because they indicate that the immersion experience has not had a detrimental effect on cognitive development, there are some reservations. First, the study was limited to a small group of French immersion children (N=29) at only one grade level, all of whom attended dual-track schools and came from primarily English-speaking homes in a predominantly English-speaking community. Therefore, while French was the sole language of instruction for these children, they appeared to have many opportunities to develop and practice their first language, English. It was not evident from consent-form information whether or not other languages were spoken in the home and in which situations. Generalization of results to different grade levels or to different educational or community settings should not be made without further investigation. Second, while the study relays useful information about the WISC-R performance of French immersion children to educators and parents, any comparison to regular program peers is limited because it is not clear whether the French immersion and regular program groups were equivalent when they started school. Very little information was available as to how parents chose the language of instruction for their children in these dual-track schools; however, information obtained through interviews with principals, teachers and parents suggested that children with any obvious or suspected problems were not encouraged to enroll in early immersion programs. Therefore, children who for many reasons might experience problems

in school were most likely enrolled in the regular program. Consequently, because of possible initial differences between French immersion and regular program groups, current results cannot be interpreted as indicating how immersion children would perform if they had been enrolled continuously in the regular program; rather, results only describe WISC-R performance compared to that of their "matched" English-instructed peers.

Finally, the study included only students who had been continuously enrolled in their current language of instruction. Therefore, only those students who had survived the initial immersion experience and remained in the program were tested. Five of the 60 randomly selected regular program students were "dropouts" from French immersion and, therefore, were not tested.

Conclusions and Implications for Practice

The results of this study indicate that the WISC-R central tendancies and variance-covariance structure are essentially the same for the French immersion and regular program quasi-matched groups. Therefore, use of the WISC-R does not appear to be disadvantageous for use with higher SES French immersion children whose main language of the home is English. However, results cannot be interpreted as an indication of how French immersion children would have performed had they been enrolled in the regular (English) program.

The high means for both the French and the regular program groups are more consistent with Holmes' results than with those reported in the WISC-R manual for the American standardization group. Therefore, reference to British Columbia norms for children aged 7½, 9½, and 11½ appears to be appropriate for determining more realistic expectations.

Results of this study suggest that although all formal education has been in French, immersion students are able to communicate at a level equivalent to that of their regular program peers in this English-language testing situation. This finding is consistent with the developmental interdependence hypothesis which proposes that the development of skills in a second language is a function of the level of the child's first language competence at the time when intensive exposure to the second language begins (Cummins, 1978b). The children who are successful in French immersion programs (that is, they remain in them) appear to have adequately developed expressive English-language skills. The first language of middle-class, majority-language children in early immersion programs is probably reinforced both inside and outside the home. Consequently, it is developed to a sufficiently high level that it is largely unaffected by intensive exposure to a second language.

At the grade two instructional level there is no evidence of any cognitive advantage (as measured by the WISC-R) as a result of the immersion experience. Cummins (1983) proposes that the cognitive and academic effects of bilingualism are mediated by the levels of competence which bilingual children attain in both their first and second languages. It appears that after three years of total French immersion these children have reached a threshold level of linguistic competence which enables them to avoid cognitive disadvantages, but does not yet allow the cognitive advantages which results of longitudinal studies have indicated.

Implications for Further Research

Because the results of this study are limited to only one grade level, there is a need for further WISC-R research with children at other

age levels. While children at the grade two level show no signs of any cognitive disadvantages as a result of their immersion experience, this may not be the case for children in kindergarten and grade one who are not as advanced in their linguistic development. In addition, children beyond the grade two level may have reached a linguistic threshold which would enable them to derive cognitive advantages from their bilingual experience.

Comparisons of French immersion with regular program students using other individually-administered cognitive measures is also needed. The Kaufman ABC could be used to explore Verbal and Performance differences.

Ideally, a pre- and post-test design comparing French immersion students to a control group of their regular program peers would more accurately portray the effects of immersion programs on intellectual development as measured by individually administered tests. It would be interesting to follow the stability of IQ scores across grade levels from the beginning of their formal schooling through the duration of the immersion program, compared to that of regular program students.

Research is needed to determine if the performance of a group of lower SES French immersion children would differ significantly from that of the French immersion group in the present study.

Finally, there is a need for well-controlled studies of children in French immersion programs who are experiencing learning problems, and of those who have switched to the regular program.

REFERENCE NOTES

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APPENDIX A

LETTER TO PARENTS AND CONSENT FORM

Dear Parents:

_____ School has agreed to participate in a research project involving the use of individual intelligence tests in Early French Immersion schools. The project requires the cooperation of 60 children in the Coquitlam school district to take a test which is frequently used in our schools. This particular test was prepared for children in the United States whose language of instruction was English. It has been checked for its applicability to three age groups of B.C. school children enrolled in English-language programs.

The research project is being undertaken as a master's thesis in the division of Educational Psychology at the University of British Columbia. It has been endorsed by the supervisor of curriculum and assessment for this district, Mr. T. Wheeler, and by the principal of your school. Financial support for the project was provided through a grant from the Educational Research Institute of B.C.

_____ 's name was randomly drawn as a possible participant in this research. If you and your child agree to participate, _____ will be asked to take part in one testing session, approximately 75 minutes long. The testing will be done individually by a trained graduate student in the school. This type of testing is common practice in schools and is usually experienced as interesting and enjoyable by the children involved. The results of the tests will be strictly confidential: your child's name will not appear on the test forms. No individual test results will be released. The purpose is not to check any one child's performance, but to determine if the French Immersion children score similarly to American and B.C. children enrolled in English-language programs. If they do not, adjustments will be made in the future so that the test is more accurately interpreted for French Immersion children. Project results will provide useful information to all professionals involved in the area of educational assessment.

I wish to emphasize that participation is voluntary and that withdrawal from the project at any time will not jeopardize your child's class standing. I would, however, greatly appreciate your agreement to assist in this research.

Please complete the Parent Consent Form and return it to the school as soon as possible.

Thank you. Feel free to contact me for any further information at 228-0896.

Sincerely,

Barbara Nielsen

PARENT CONSENT FORM

I consent to _____'s participation in the testing research study at _____ school. I am aware that this will involve a testing session of approximately one hour and fifteen minutes duration. I understand that confidentiality of test results will be maintained and that no individual scores will be released. I also understand that participation in this project is voluntary and may be terminated at any time.

_____
signature

Your assistance in providing the following information would be very helpful in making this a meaningful study:

1. What is the main language spoken in your home? _____

2. Would you please circle the number in front of the category below which best describes the completed level of education of the head of your household (that is, the major wage-earner in the family).

   I Less than high school completion

   II High school completion

   III Post-secondary, no degree

   IV University or college degree

3. Has your child been enrolled in the regular English program continuously from Kindergarten through to the present time?

   Yes No

4. Has your child been enrolled in the French Immersion program continuously from Kindergarten through to the present time?

   Yes No

5. Why did you choose this language program for your child? _____

_____

_____

.....

I am unwilling to have _____involved in the testing research study.

_____
Signature

APPENDIX B

VARIANCE-COVARIANCE MATRICES AND

INITIAL GROUP MEANS AND STANDARD DEVIATIONS

Table A1

Means and Standard Deviations of Initial Groups[a]

	French Immersion[b]		Regular Program[c]	
	Mean	s.d.	Mean	s.d.
Verbal Subtests				
Information	11.18	2.77	11.42	2.53
Similarities	11.41	3.02	12.09	2.68
Arithmetic	11.64	2.62	10.38	2.30
Vocabulary	12.33	2.80	12.11	2.74
Comprehension	11.80	3.12	10.87	2.79
Digit Span	10.74	2.48	10.56	2.64
Performance Subtests				
Picture Completion	11.90	2.95	11.27	2.44
Picture Arrangement	12.23	3.54	12.53	3.31
Block Design	13.49	3.53	12.58	2.38
Object Assembly	12.31	2.81	11.42	2.45
Coding	10.87	3.29	10.69	3.20
Mazes	12.74	2.49	13.04	2.95
Sums of Scaled Scores				
Verbal IQ	109.92	12.70	107.93	12.22
Performance IQ	115.92	12.77	111.58	12.26
Full Scale IQ	114.00	11.99	110.67	11.67

[a] Prior to matching students in the two groups for educational level of head of household.

[b] N = 39

[c] N = 45

Table A2

Variance - Covariance Matrix

French Immersion

	1	2	3	4	5	6	7	8	9	10	11	12
1. Information	6.48											
2. Similarities	4.32	8.44										
3. Arithmetic	2.07	1.48	7.06									
4. Vocabulary	3.56	4.25	1.20	8.10								
5. Comprehension	3.82	2.98	1.78	4.34	10.42							
6. Digit Span	1.11	1.97	1.96	1.35	2.42	5.34						
7. Picture Completion	1.54	2.04	1.82	2.43	-0.39	1.21	7.00					
8. Picture Arrangement	-1.12	0.78	-0.71	-0.48	-1.07	-1.44	-2.04	11.31				
9. Block Design	3.57	1.26	3.23	-0.28	-0.38	3.26	3.21	-2.22	13.79			
10. Object Assembly	2.46	1.03	3.56	-0.02	1.84	0.78	2.75	0.05	3.89	6.54		
11. Coding	4.36	2.90	0.48	-0.80	2.30	0.74	0.00	-0.42	3.47	3.56	11.47	
12. Mazes	0.29	0.74	0.70	0.53	-1.20	2.06	1.18	-1.07	3.74	-0.18	-1.51	6.22

Table A3

Variance - Covariance Matrix

English Program

		1	2	3	4	5	6	7	8	9	10	11	12
1.	Information	6.54											
2.	Similarities	2.47	6.12										
3.	Arithmetic	3.07	1.42	5.31									
4.	Vocabulary	3.64	1.77	2.70	6.75								
5.	Comprehension	4.07	2.73	1.46	5.88	8.34							
6.	Digit Span	3.58	2.14	2.30	3.24	3.81	4.54						
7.	Picture Completion	-0.38	0.17	-0.75	-0.50	0.92	-0.26	3.50					
8.	Picture Arrangement	0.03	0.79	0.48	0.10	-0.14	-0.66	1.06	9.85				
9.	Block Design	0.93	2.11	2.37	1.59	1.54	0.81	0.14	0.63	4.03			
10.	Object Assembly	1.87	0.67	1.30	1.84	2.74	0.68	0.17	1.01	1.99	6.90		
11.	Coding	0.73	0.65	-1.10	-0.38	1.19	1.25	1.48	0.30	-0.47	2.11	8.94	
12.	Mazes	0.99	2.13	1.16	1.18	0.52	0.84	-0.25	-2.12	1.37	-0.83	-2.24	7.54

POOR

QUALITY

ORIGINAL